ESTIMATES OF HEALTH CARE FINANCE PROGRESSIVITY IN PORTUGAL: HOW ROBUST?

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1 — Introduction

Various articles by European authors have in recent years provided estimates of the degree of progressivity of health care financing systems (*e. g.* Wagstaff, van Doorslaer *et al*, 1992; Pereira and Pinto, 1992; Rodriguez *et al*, 1992; Lachaud and Rochaix, 1992; van Doorslaer *et al.*, 1993; Christiansen, 1993; Pereira, 1996). Drawing on well-established methods in the public finance literature, all these studies have established pretty much the same conclusions. General taxation is typically a progressive means of raising revenue, largely as a result of direct taxes with indirect taxes being regressive or close to proportional; social insurance tends to be regressive, though less so than private health insurance; and out-of-pocket payments are the most regressive form of raising revenues for the health service. Not surprisingly, mainly tax-financed systems such as those operating in Denmark, the UK and Ireland tend to be progressive, whilst social insurance systems, such as those operating in France and the Netherlands, tend to be regressive. Predominatly private systems, such as the American and Swiss systems, tend to be particularly regressive.

Because a considerable number of studies have pointed in the same direction, these conclusions have gained wide acceptance by health economists. However, none of the studies have established whether the results are sensitive to the impact of methodological choices (*e. g.* the choice of income equivalence scale or the method of aggregating inequality in different parts of the income distribution). It is known that issues such as these are the source of heated debate in the public finance literature (Atkinson, 1990). Indeed, it has become common for studies in that field to carry out sensitivity analyses on assumptions to check the robustness of conclusions. The present article follows this tradition by examining the reproducibility of recent results on health care finance progressivity in Portugal in the light of alternative plausible assumptions.

The article shows that although there may be disagreement about particular methods, or even about attitudes to differential treatment of unequals (vertical equity), some relatively robust conclusions can be drawn. On the other hand, where alternative specifications are shown to have an impact on results, the analysis provides useful information to the interpretation of past and future empirical work.

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The paper is organized as follows. Section 2 provides a succint review of the common approach taken by the present and previous studies on health care financing progressivity. As in the taxation literature, empirical research in the field mainly draws on concentration curve methodology and uses a partial-equilibrium static framework. The section also briefly describes the data sets used in the analysis — household budget surveys from 1980-1981 and 1989-1990. Section 3 presents baseline incidence assumptions, variable definitions and numerical estimates of health care finance progressivity for Portugal, as presented in Pereira (1996). These results are used as the reference distribution for comparing the impact of plausible alterations in methodological choices.

Section 4 — which is the main part of the paper — presents the sensitivity analyses. Six issues over which there is uncertainty in the literature are considered: aggregation of health care finance inequality at different points of the income distribution; assumptions regarding the incidence of corporate taxation; equivalent scale adjustments to the income variable; the method of weighting observations; choice of ability to pay proxy; and equivalization of the payments distributions. The empirical strategy involves *ceteris paribus* simulations: for each issue only the variable under discussion is allowed to change; all other methodological assumptions are left unaltered. The article ends with section 5 where some concluding remarks are provided.

2 — Methods and data

2.1 — Approach and tools of measurement

In Portugal, as in the majority of countries, it is commonly accepted that health care financing should reflect ability to pay rather than use of services. This requirement can be interpreted in terms of both vertical and horizontal equity. In studying the former question, health economists have quite naturally made use of progressivity indices, commonly used in the applied public finance literature to measure the extent to which different people pay different rates of taxation. By analogy to the progressivity of taxation, a health care financing system is described as *progressive* when health care payments rise as a proportion of income as income rises; *regressive* when payments fall as income rises; and *proportional* when everyone contributes towards the cost of health care in the same proportion as the income they hold.

The present paper follows the same approach, making use of the well-known Kakwani (1977) global progressivity index. This is defined as follows:

$$\pi_K = C_{hf} - G_y \qquad (1)$$

where C_{hf} is the concentration coefficient for health care payments and G_y is the Gini coefficient for income. The bounds of π_K depend on inequality in the income distribution. Maximal regression is given by $-1 - G_y$ (-2.0 if all income is held by one person and all health care payments are made by another). Maximal progression, on the other hand, is given by $1 - G_y$ ($+1.0$ if income is equally distributed and a single person finances the entire health care system).

Negative, positive and zero values of π_K imply regressivity, progressivity and proportionality, respectively.

Empirically, the Kakwani index is calculated from microdata using the so-called *covariance* method (Lerman and Yitzhaki, 1984; Jenkins, 1988):

$$\pi_K = \frac{2\ cov\ [hf, F(y)]}{\mu_{hf}} - \frac{2\ cov\ [yf, F(y)]}{\mu_y} \qquad (2)$$

where *cov* $[\cdot]$ denotes covariance; *hf* and *y* are the levels of health care payments and income of a household with income *y*; *F(y)* is the population share of individuals whose income is no greater than *y;* and μ_{hf} and μ_y are respectively the mean level of health care payments and income.

Descriptions of the methodology are given in, *inter alia*, Van Doorslaer *et al.* (1993) and Pereira and Pinto (1992). It is basically an application of the tax incidence evaluations carried out by Pechman, Musgrave and others [*e. g.* Pechman and Okner (1974), Musgrave *et al.* (1974), Reynolds and Smolensky (1977), Pechman (1985)]. The advantages of this approach are its transparency, in the sense that assumptions are made explicit, and applicability, which means that detailed evidence on a matter of considerable interest to policy makers can actually be provided.

The health care system progressivity estimates presented in this paper are based on macro-weighted aggregation of sample survey estimates for the four key sources of finance in the portuguese health system: *i*) *general tax revenues*, which are used to fund the NHS and to subsidize occupational insurance schemes operating in the public sector; *ii*) *social insurance contributions* to occupational schemes, of which by far the largest is the ADSE scheme for public servants and their families; *iii*) *private insurance premiums*; and *iv*) *direct expenditures*, including NHS co-payments and payments to the private sector.

2.2 — Data

The data are drawn from two household budget surveys carried out by the National Statistical Institute: the 1980/1981 Family Income and Expenditure Survey (FIES 80 for short) and the 1989/1990 Family Budget Survey (FBS 90). The sample sizes are respectively 8039 and 9640 households, corresponding to 26753 and 29622 individuals. The surveys cover the non-institutionalized population of Portugal and yield representative estimates.

Household budget surveys are the only data sources available in Portugal that permit the overall health financing burden to be measured. Naturally, they are not free of drawbacks, the main one of which concerns data reliability (see Pereirinha, 1988). There are three potential sources of bias: recording errors, differential non-response and an atypical year of comparison. With respect to the first two, there is insufficient documented evidence to allow accurate corrections to be made (see Pereira, 1995). Only in the latter case does the available information permit any reasonable form of correction. The FBS 90 coincides with the introduction of a new income tax system which led to a temporary distortion of the underlying distribution of taxes. As a general rule, from 1989 onwards

taxes on income were retained at source, whereas before an interval of one year elapsed between income accrual and payments. This meant that in 1989 many households paid income taxes under the «old» and «new» systems; the main exceptions being the large proportion of poorer households who make no such payments (*e. g.* the unemployed, persons on state pensions and those whose incomes did not reach the payments threshold). Therefore, payments reported in the FBS 90 are likely to overstate the true degree of progressivity of the income tax system. In order to correct this deficiency I have excluded payments of taxes abolished under the new system. This option is not without its problems, but is likely to provide a more accurate picture of the underlying distribution than if all payments reported in the survey were included.

3 — Baseline estimates

3.1 — Incidence assumptions

In assigning the financing burden for the baseline distribution a standard set of incidence assumptions, also followed in virtually all previous work on health care finance progressivity, have been adopted. Income, property and capital taxes are assumed to be borne fully by tax-payers. This conjecture implies that factor supply is either fixed or fairly inelastic. Corporate income taxes are assumed to be divided equally between capital income recipients and consumers ([1]). Indirect taxes on both final and intermediate goods and services are assumed to be fully shifted to consumers. The incidence is therefore allocated according to the consumption propensities of households.

Payments to occupational insurance schemes are assumed to be borne by the employees' households. Note that employer contributions are largely irrelevant to the portuguese case given that general social insurance is not used to finance health care expenditures. The «social insurance» component measured in the analysis refers to mandatory contributions made overwhelmingly by public sector workers. It is assumed that any eventual deficits in the relevant schemes are borne by tax-payers. Finally, earmarked payments — private insurance premiums and net direct expenditures — are assumed to fall entirely on the households who make the payments.

3.2 — Variables

Variable definitions are described at length in Pereira (1996). Briefly, in the baseline analysis, a household's *ability to pay* is measured by its gross income adjusted by the number of equivalent adults. The equivalence scale used for this purpose is that of the OECD (1982), also used in the vast majority of

([1]) Given the controversy which surrounds the incidence of this tax and the fact that household budget surveys may provide an incomplete picture of its distribution, two other alternatives are considered later in the paper: *i*) that the incidence falls completely on dividend recipients and *ii*) that the burden is passed on to consumers in terms of higher prices.

empirical research by portuguese authors on income inequality and poverty (*e. g.* Rodrigues, 1993; Ferreira, 1993; Costa, 1994).

Personal *direct taxes* (*e. g.* income tax, property taxes, inheritance tax) have been allocated on the basis of actual payments reported by households. Corporate taxes have been allocated half in proportion to capital income and half in proportion to household expenditure. The total direct tax variable is weighted in accordance with the revenues raised from non-corporate and corporate taxation. For the reasons stated earlier, the 1989/1990 analysis excludes taxes abolished under the new income tax system. The allocation of *indirect tax* financing is based on work carried out by Domingues *et al.* (1984). The authors estimated the tax burden both before and after the introduction of VAT. The before-data, which are used for the FIES 80 analysis, refer to estimates for 1979. The after-data, used for the FBS 90 analysis, are a simulation of the same information admitting VAT rates very similar to those actually in place during 1989/1990 (see Pereira (1996) for further details) ([2]). Stamp duty and excise taxes on tobacco, petrol and other goods were not considered. Given that in the present analysis the overall health care financing burden is weighted by the full share of indirect taxation, the implicit assumption is made that ommited taxes are distributed as those that are included.

The variable termed *social insurance* represents mandatory contributions to occupational schemes. It is assumed that the distribution of health related payments reflects that of social insurance contributions made by civil servants ([3]). The distributions of *private insurance premiums* and *direct payments* are derived directly from the actual values reported by households. In the second case, the data provide a considerable amount of detail with regard to the type of care consumed (*e. g.* pharmaceuticals, doctor visits), but not with respect to the sectoral mode of consumption (*e. g.* NHS or private). In both years, direct payments have been computed net of reimbursements. However, because of data limitations, no account is taken of tax rebates that households might receive in respect of their health care expenditures (on this issue see Pinto and Santos, 1993).

Two further definitional issues of some importance concern the weighting of units and allowance for differences in household structure in the payments variables. In both cases, the assumptions adopted in previous research by health economists are followed. Namely, that each household is given equal weight irrespective of the number of individual members; and that health care payments are not adjusted for household size and composition. The rationale for these choices is that the rules governing health care payments typically relate to families or households rather than individuals, and that economies of scale are unlikely to apply in health care consumption (Wagstaff *et al.*, 1992). Because there are some grounds for disagreement on these issues the assumptions are relaxed in section 4.

([2]) Recent estimates by Albuquerque and Neves (1994) based on the FBS 90 suggest that the degree of progressivity simulated by Domingues et al (1984) is a close approximation to reality (particularly the overall burden of indirect taxes).

([3]) The civil servants' health fund (ADSE) accounts for around 75 % of all health related social insurance financing.

3.3 — Baseline estimates

The baseline results are shown in table 1. The Kakwani indices for the health care system as a whole were computed as weighted averages of the estimated indices for the source distributions, with the shares of total finance being derived from OECD (1993) and Pereira *et al.* (1993). The results and associated graphical representations — Lorenz and concentration curves — are discussed extensively in Pereira (1995, 1996). The main conclusions are as follows.

Over the 1980's, *total health care financing* in Portugal became unequivocally more favourable to the rich, mainly as a result of reduced progression in the tax system and an increase in the revenues raised directly from consumers. In 1980-1981, the overall financing system was marginally progressive, with the Kakwani index displaying a value of 0.019. By 1989/90, the estimates show a decline of roughly five points, suggesting that health care finance had become slightly regressive. Comparison with international results (Van Doorslaer *et al.*, 1993) suggests that the change was relatively large; while detailed analysis of proportional shares paid by income deciles indicates that the finance burden shifted to middle income groups with the principal beneficiaries being households situated in the richest quintile.

TABLE 1

Health care financing share and progressivity (Kakwani indices) 1980-1990

	Percentage share of total finance		Kakwani index	
	1980	1990	1980	1990
Direct taxes	23.2	20.7	0.227	0.127
Indirect taxes	42.8	34.5	0.092	0.047
Social insurance	5.2	6.0	0.245	0.244
Private insurance	0.6	1.4	0.175	0.152
Direct payments	28.2	37.4	− 0.196	− 0.186
Total payments	100.0	100.0	0.019	− 0.027

The results also show that alternative forms of finance have quite distinct progressivity characteristics. *Direct taxes* are highly progressive, despite there being a noticeable reduction in the degree of progressivity throughout the 1980's. This result seems at odds with other research using the same data bases. For example, Rodrigues (1993) and Gouveia and Tavares (1995) when measuring the distribution of disposable income in Portugal using the FIES 80 and FBS 90 concluded that inequality had decreased in the period, which seems incompatible with the reduced levels of progressivity identified here. However, both these papers failed to consider the biasing effect of the 1989 tax reform. They subtracted taxes levied under the «old» *and* «new» systems when computing individual disposable income levels. Furthermore, they also subtracted contributions which are not included in the present analysis (*e. g.* employee social insurance

contributions). It is these factors which apparently explain the discrepancy in the results. For the reasons given previously, the approach followed in this paper is the more useful if one wishes to estimate the underlying distribution of direct taxes (or income net of those taxes) at the beginning of the 1990's.

Levels of progressivity/regressivity for the other sources of finance remain relatively stable over the 1980's. *Indirect taxes* are shown in both periods to be close to proportional, a result which is in conformance with recent estimates by Albuquerque and Neves (1994). The *tax system as a whole*, which accounts for the greater part of health financing in Portugal, clearly favours the least well-off, though naturally less so in 1990 due to the fall in the level of direct tax progressivity. *Social and private insurance* contributions are globally progressive in both periods, but this is largely explained by the phenomenom of selective coverage of households that are better-off (see Pereira (1995) for an explanation). The same cannot be said of *out-of-pocket payments* which affect the whole population and are shown to be highly regressive. On the whole, these results tend to confirm the findings of previous studies in other countries (see in particular Van Doorslaer *et al.*, 1993).

4 — Sensitivity analysis

Attention is now turned to the issue of robustness (*i. e.* with examining the reproducibility of the above results in the light of alternative plausible assumptions). The analysis considers six issues over which there is uncertainty in the literature: aggregation of health care payments inequality at different points of the income distribution; assumptions regarding the incidence of corporate taxation; equivalent scale adjustments to the income variable; the method of weighting observations; choice of ability to pay proxy; and equivalization of the payments distributions. The empirical strategy involves *ceteris paribus* simulations: for each issue only the variable under discussion is allowed to change; all other methodological assumptions made in section 3 are left unaltered. Issues related to data quality, important as they are, are not addressed. Such questions are best handled by contrasting the results with those obtained from improved data sources, when these become available.

4.1 — Different distributional perspectives

The first check for robustness involves the use of parametrically weighted Kakwani indices — so-called *generalized indices* (Lambert, 1988). These measures incorporate explicit assumptions about the weight attached to different points of the income distribution; and may therefore be seen as reflecting alternative judgements about the degree of progressivity preference. This is an important issue given that the normative basis of health care finance inequity measurement is somewhat debatable (see, *e. g.*, Aaron, 1992). There are no clear guidelines from policy-makers as to the desired degree of progressivity, merely a stipulation that payments be related to ability to pay [see, *e. g.*, Mendo (1993)]. Economic studies have chosen to examine inequity by means of standard

progressivity indices derived from the concentration approach. These measures have desirable properties, but they are simply statistical devices that measure deviations from proportionality. In using them, the researcher implicitly accepts that progressivity should be portrayed in terms of relative payments distances and relative income distances (between equidistant incomes) and that proportionality of payments is the neutral reference system. The measures also have specific weighting schemes for aggregating disproportionality which may, or may not, accord with the values of the policy maker. It is advisable, therefore, that checks are made on the robustness of empirically observed inequality rankings to different distributional judgements.

The family of *generalized Kakwani indices* is defined as follows:

$$\pi_K(\delta) = \delta(\delta - 1) \int_0^1 (1-p)^{\delta-2} [L_y(p) - Z_{hf}(p)]dp \qquad (3)$$
$$= C_{gf}(\delta) - G_y(\delta)$$

where $Z_{hf}(p)$ and $L_y(p)$ are the health finance concentration curve and Lorenz curve for income; and $C_{hf}(\delta)$ and $G_y(\delta)$ are generalized concentration coefficients for health care payments and generalized Ginis for income, respectively. Equation (3) defines various coefficients, one for each value of the distributional judgement parameter $\delta > 1$. As $\delta \to 1$, $\pi_K(\delta)$ approaches zero for all distributions, implying indifference to departures from proportionality. When $\delta = 2$, $\delta_K(\delta)$ gives the standard Kakwani index. Values of $\delta > 2$ yield progressivity estimates that register concern with the health care financing position of poorer members of society. The sign properties of $\delta_K(\delta)$ are identical to those of the related standard progressivity measure.

Computation of generalized progressivity indices provides a partial, but important, response to the normative problems highlighted above. By varying a single parameter, the robustness of progressivity estimates to different distributional judgements (including, perhaps, those of the policy maker) can be explored. Furthermore, the alternative weighting schemes of the parametric measures may be seen as emulating the range of measures suggested by progressivity indices derived from an explicit normative approach [*e. g.* those of Blackorby and Donaldson (1984) and Kiefer (1985)]. If the results obtained from varying the distributional judgement parameter point in the same direction, then the robustness of conclusions is improved.

TABLE 2

Health care finance progressivity. Generalized Kalkwani indices

Source	δ = 1.01		δ = 1.5		δ = 2.0		δ = 3.0		δ = 5.0	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
Direct taxes	0.001	− 0.001	0.169	0.082	0.227	0.127	0.262	0.172	0.271	0.206
Indirect taxes	0.000	0.001	0.013	− 0.007	0.019	− 0.002	0.020	0.009	0.015	0.022
Total taxes	0.000	− 0.000	0.061	0.026	0.092	0.047	0.095	0.070	0.094	0.091
Social Insurance	0.001	− 0.001	0.171	0.215	0.245	0.244	0.296	0.230	0.308	0.208
Private insurance	0.000	− 0.001	0.120	0.119	0.175	0.151	0.234	0.180	0.272	0.219
Direct payments	− 0.001	− 0.002	− 0.136	− 0.128	− 0.196	− 0.186	− 0.258	− 0.245	− 0.316	− 0.292
Total payments	0.000	− 0.001	0.012	− 0.020	0.019	− 0.028	0.007	− 0.038	− 0.009	− 0.046

Values of $\delta_K(\delta)$ in the range $\delta = 1$ to $\delta = 5$ were computed for each the financing sources as well as for the total payments distribution (table 2) ([4]). For aggregate health care payments, the measurements generally suggest a shift towards regressivity between 1980 and 1990. The only exception is the inequality indifferent index, $\delta = 1.01$. Therefore, unless one is unconcerned about disproportionality of the payments distributions, it is hard to escape the conclusion that the distribution of health care payments became less favourable to the poor throughout the 1980's.

The estimates for the source distributions also tend to confirm the earlier results. Where there are exceptions, the new measurements may be seen to provide further informational content. For instance, the $\delta = 5$ index suggests that indirect taxes became more progressive in the later period, whereas at lower values of δ an opposite movement is suggested. This is because the $\delta = 5$ measure is highly sensitive to disproportionality in the lower end of the income distribution, leading it to detect an improvement in the position of the very poorest.

4.2 — Changing tax-incidence assumptions

Another area where the results may be challenged is with regard to incidence assumptions. Research in the taxation literature has shown that judicious choice of shifting assumptions can make a tax system appear either steeply progressive or sharply regressive (Whalley, 1984). It is also the case, however, that apart from three types of contribution — corporation taxes, property taxes and employer social insurance contributions — a set of «standard» incidence assumptions appears to have gathered wide agreement in the partial equilibrium literature (Atkinson and Stiglitz, 1980). Of the exceptions, only the first is quantitatively important in the financing of Portuguese health care. Therefore, two further assumptions are considered in this section with a view to evaluating their impact on the earlier conclusions: *i*) assuming that corporate tax incidence falls exclusively on dividend recipients, and *ii*) that the burden is fully shifted to consumers in the form of higher prices. The first of these would be likely to hold in the case of a long-run competitive equilibrium situation with intersectorally mobile capital. The second, if markets are oligopolistic and firms have the power to set their prices to cover what they regard as costs plus a margin for profits. Other justifications are also possible [see, *e. g.*, Pechman (1985)]. The initial assumption of a 50:50 split between dividend recipients and consumers may be seen as an intermediate compromise between these extreme hypotheses.

The results (shown in table 3) confirm that changing incidence assumptions can have an appreciable effect on the progressivity of the tax system. For instance, estimates of the direct tax Kakwani index for 1980 vary between 0.151 and 0.301; for the tax system as whole, between 0.066 and 0.118. Unsurprisingly, the full shifting assumption produces the least progressive results. However, the important result from the point of view of this paper is that the conclusions re-

([4]) The formula used for computing the generalized concentration indices is an adaptation of one provided by Lerman and Yitzhaki (1989) for the generalized Gini index.

garding the evolution of health care financing progressivity throughout the 1980's are not altered. Whichever of the three variants is chosen there is a shift of some 4 or 5 points in the Kakwani index towards regressivity. Thus, once again the earlier results are shown to be robust.

TABLE 3

The impact of alternative assumptions concerning corporation taxes. Kakwani indices

	Variant 1		Variant 2		Variant 3	
	1980	1990	1980	1990	1980	1990
Direct taxes	0.227	0.127	0.301	0.188	0.151	0.071
Total taxes	0.092	0.047	0.118	0.069	0.066	0.025
Total health care payments	0.019	−0.027	0.036	−0.016	0.002	−0.040

Notes:

Variant 1 — Incidence falls 50 % on capital income receivers and 50 % on consumers.
Variant 2 — Incidence falls on dividend recipients.
Variant 3 — Incidence falls on consumers.

4.3 — Sensitivity to equivalence scales

While shifting assumptions are perhaps the most crucial part of any incidence calculation, the «ability-to-pay» measure is also very important (Whalley, 1984). The following three sensitivity analyses consider the impact of alternative specifications of the income variable, beginning with the effect of equivalence scale relativities. The baseline estimates were arrived at by deflating gross household incomes by the OECD equivalence scale. The choice of this scale was largely determined by pragmatic considerations (*e. g.* its frequent use in current portuguese research). This detail, together with the uncertainty surrounding the equivalence scale issue (Coulter *et al*, 1992a), suggest a need to verify the robustness of the earlier measurements to different scale relativities.

For reasons of tractability and clearer recognition of scale effects, it is assumed that all equivalence scales can be characterized simply in terms of family size and a single key parameter. Buhmann *et al.* (1988) have shown that several scales currently used in empirical work — including those that are based on other family characteristics in addition to size — can be conveniently summarized in this manner. Their scale is:

$$M_j = S_j^e \qquad (4)$$

with S_j representing the size of j th family and e, the elasticity of family «need» with respect to size. Income values are equivalized by dividing observed family incomes by M_j. Larger values of e correspond to smaller economies of size. A value of $e = 0$ implies no adjustment for size, while $e = 1$ corresponds to tak-

ing *per capita* income. Scales based on subjective evaluation of what is needed «to get along» (*i. e.* the Leyden School approach) tend to produce relatively low values of the elasticity; those based on econometric analysis of consumption patterns or on the relativities implicit in social welfare payments produce intermediate values; and normative scales (which Buhmann *et al* call «expert statistical»), are represented by high size elasticities typically greater than 0.70 (5).

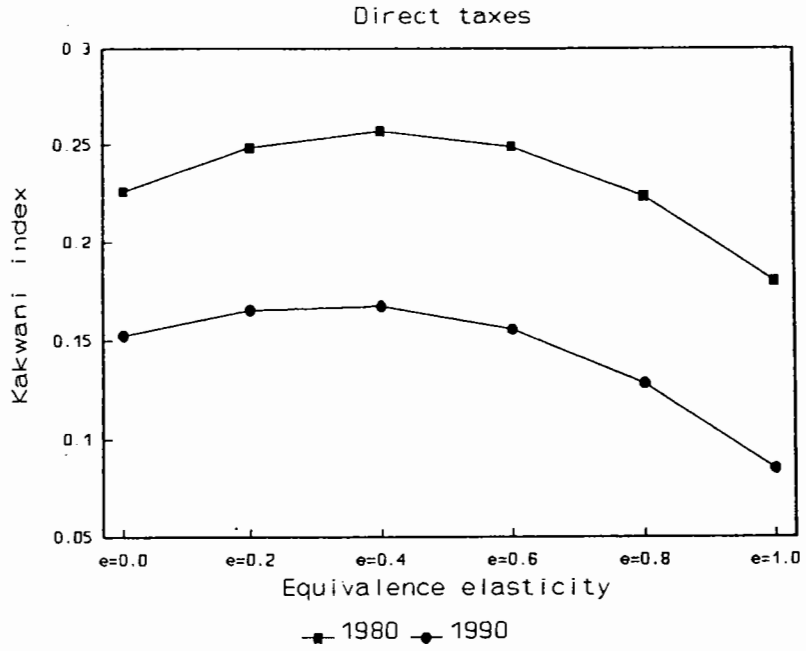
The results are presented in figure 1. The most salient point is that the 1980-1990 change in the overall payments distribution is robust in terms of all scale relativities. Therefore, whichever the relationship between economic well-being, household incomes and «needs» that is assumed, one is driven to the conclusion that health care finance became less favourable to the poor over the 1980's. The earlier conclusions regarding the time-trend of taxation and direct payments progressivity also appear to be upheld. Conversely, the direction of changes in the social and private insurance distributions seems to be affected by scale relativities. For example, at low *e*-values the social insurance estimates show a marked decline in progressivity but the effect is reversed with scales that are «generous» to large families. The reasons for this are not immediately clear, but it may be noted that in both surveys insurance contributions are largely made by smaller families. A possible implication is that progressivity estimates for non-universal sources of finance may be sensitive to equivalence scale adjustments; particularly if non-income characteristics determining participation are correlated with the factors used to construct the scale.

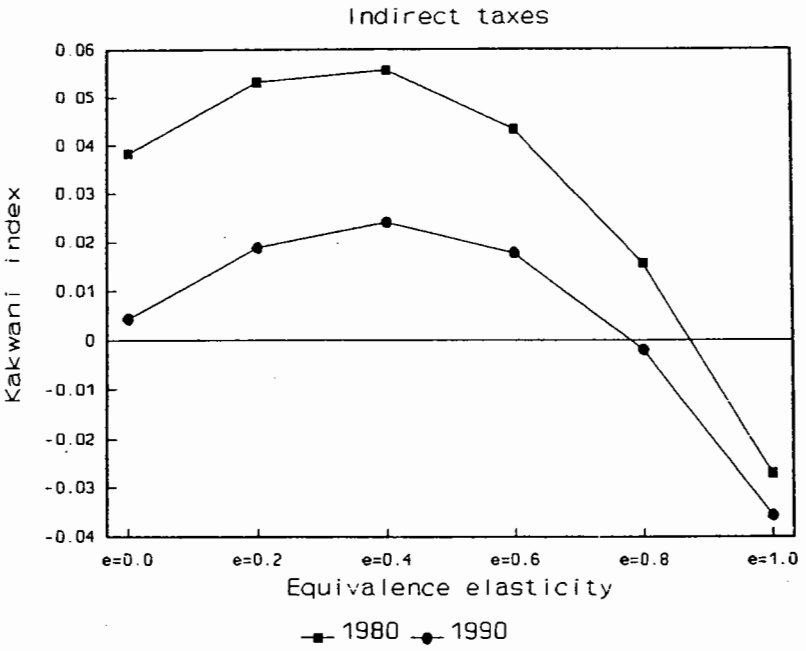
A further issue of interest is the shape of the relationship between levels of progressivity and choice of equivalence scale. For all sources there appears to be an inverted U-shaped relation, with progressivity first increasing (regressivity decreasing) and then decreasing (increasing) as the value of the equivalence elasticity is increased. Generally, this result seems to be driven by the interaction of a U-shaped effect on the Gini coefficient (first noticed by Coulter *et al.*, 1992a) and an inequality reducing quasi-linear impact on the health care finance concentration indices. This finding is relevant to future research and, indirectly, to policy analysis. It means that one cannot simply compute progressivity measures for two extreme equivalence scales and assume that intermediate scales will lead to intermediate progressivity estimates. The results also help to put into perspective other research findings. Recent work by Wagstaff *et al.* (1994) proposes to compare health care finance progressivity across countries by drawing on the equivalence scale used by Aronson *et al* (1994). As shown in Pereira (1995), this scale has an implicit $e \approx 0.44$. The present calculations suggest that the scale provides a *higher* estimate of the extent of health care finance progressivity than do other scales currently used by economists.

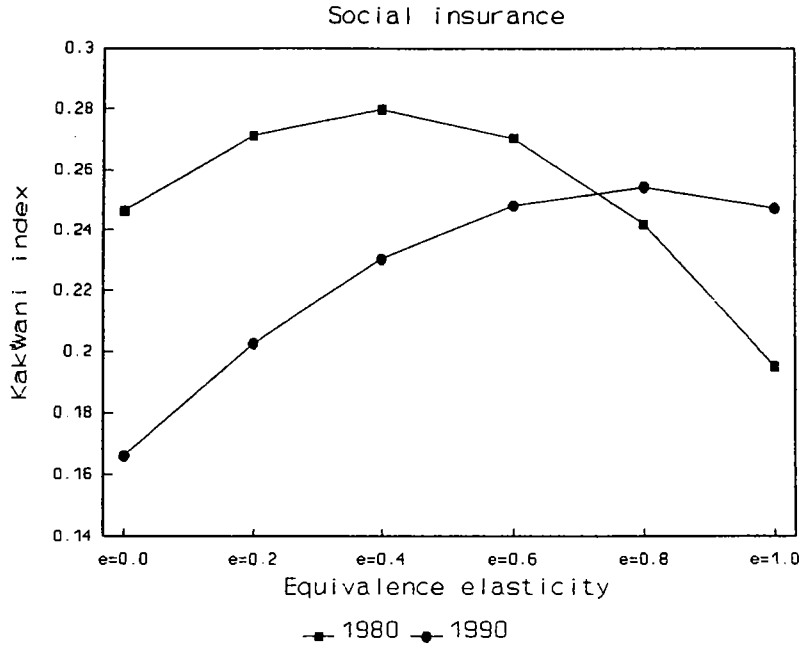
(5) Unique representations of the Buhmann *et al.* scale (or slight variations thereof) have been used in a number of income (re-)distribution studies (*e. g.* Rainwater, 1992; Aronson *et al*, 1994); and also in health economic research [*e. g.* the Italian, Spanish and Portuguese country studies in the volume by Van Doorslaer *et al.* (1993)]. Coulter *et al.* (1992a, 1992b) use the formula to measure the impact of scale relativities on computations of income inequality and poverty.

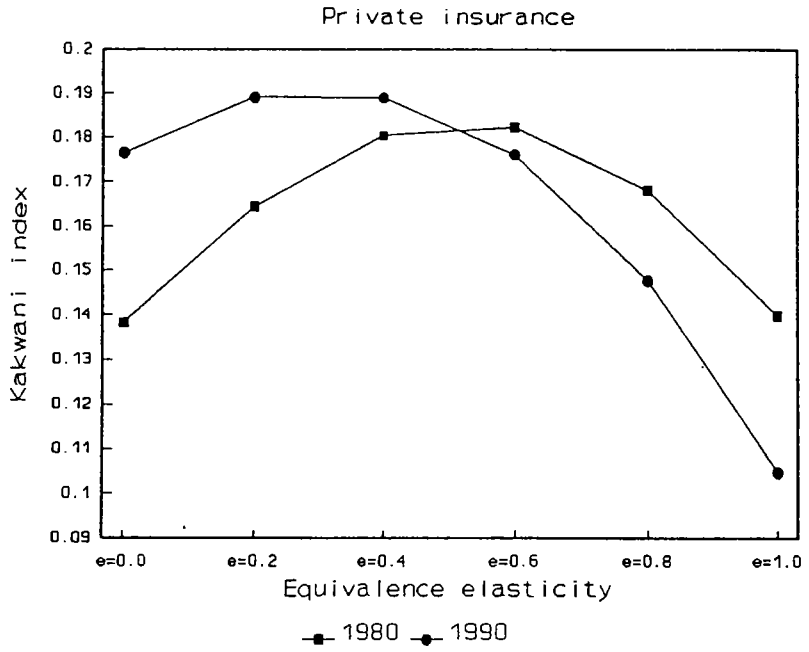
FIGURE 1

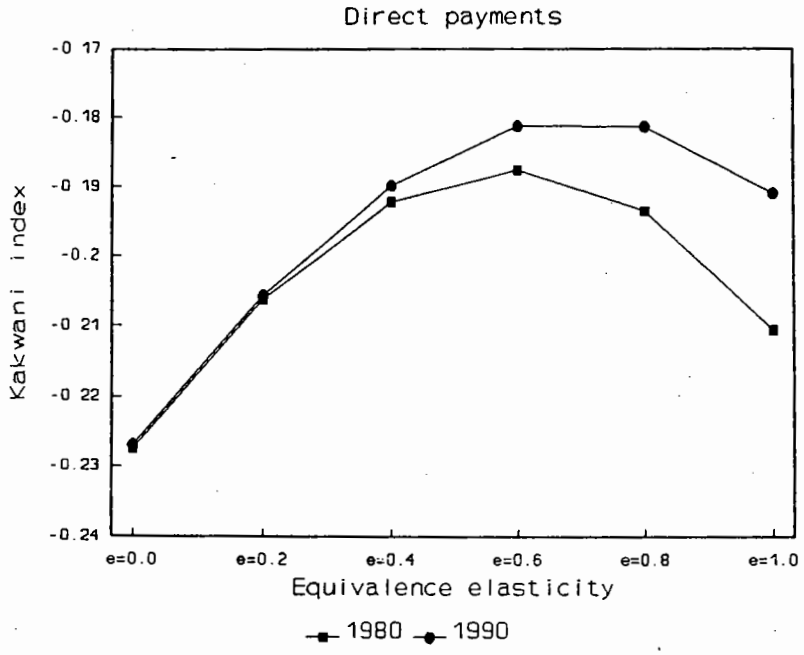
Impact of equivalence scale relativities on health care finance progressivity

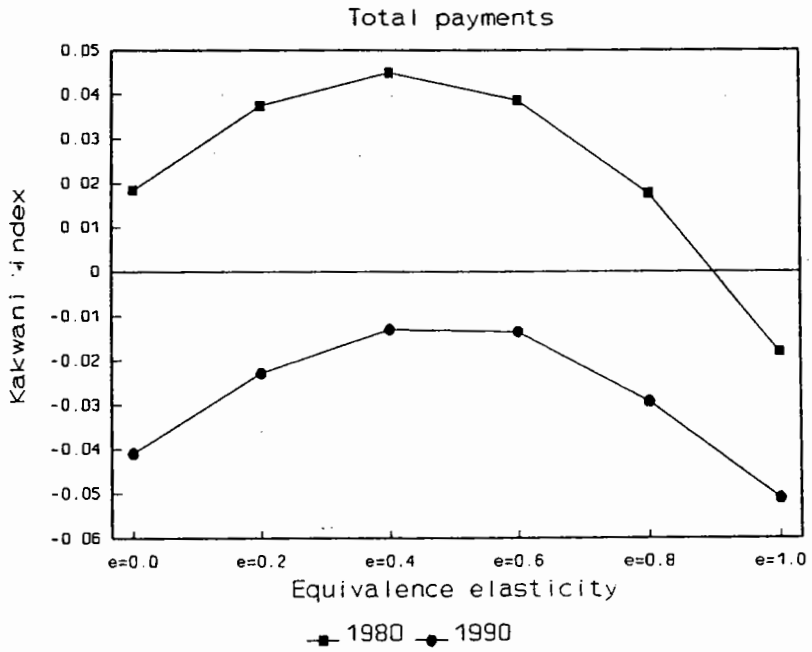





Social insurance
Kakwani index
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
e=0.0
e=0.2
e=0.4
e=0.6
e=0.8
e=1.0
Equivalence elasticity
1980
1990


Private insurance
Kakwani index
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
e=0.0
e=0.2
e=0.4
e=0.6
e=0.8
e=1.0
Equivalence elasticity
1980
1990


Direct payments
-0 17
-0.18
-0 19
-0.2
-0 21
-0 22
-0.23
-0.24
Kakwani index
e=0.0
e=0.2
e=0.4
e=0.6
e=0.8
e=1.0
Equivalence elasticity
1980
1990


Total payments
0.05
0.04
0.03
0 02
0 01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0 06
Kakwani index
e=0.0
e=0.2
e=0.4
e=0.6
e=0.8
e=1.0
Equivalence elasticity
1980
1990

4.4 — Weighting by individuals

If income is used as the «ability-to-pay» proxy, it raises the question of how the income receiving units are to be weighted. Compared to equivalence scale adjustments, this issue has received far less attention in the literature. However, it can have a considerable impact on the measure of income inequality (Danziger and Taussig, 1979), and consequently on progressivity estimates. The earlier results were weighted by household (*i. e.* the equivalent household income is counted only once for each household irrespective of the number of individual members), a procedure which has been common practice in health care finance progressivity analyses. However, recent income (re-)distribution studies have generally opted to weight by the number of individuals, given that the former approach begs the question of the number of individuals affected by economic differences. Like all other questions considered in this part of the paper, the correct approach is debatable. Hence, the value of modifying the assumptions to see if they do in fact affect the conclusions that are drawn.

Individual weighting requires that each individual in the household be attributed the household equivalent income. The results of admitting this conjecture are reported in tables 4 and 5 (along with those for remaining sensitivity analyses). Individual weighting has the effect of reducing the inequality estimates. For virtually all sources of finance, the reduction in the concentration index is greater than for the Gini coefficient. Consequently, levels of progressivity are reduced in relation to the baseline distribution. The more important point, however, is that the magnitudes of changes between 1980 and 1990 are basically the same as for the earlier results. Thus, individual weighting has no appreciable effect on overall conclusions regarding the evolution of health care finance progressivity in Portugal throughout the 1980's.

TABLE 4

Impact of different assumptions regarding weighting of income units, ability to pay proxy and equivalization of payments. Kakwani indices

Source	Baseline		Individual weighting		Net income		Equivalent payments		Combined assumptions	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
Equiv. income (Gini)	0.343	0.351	0.324	0.327	0.332	0.326	0.343	0.351	0.315	0.305
Direct taxes	0.227	0.127	0.217	0.087	0.162	0.110	0.257	0.166	0.188	0.096
Indirect taxes	0.019	− 0.002	− 0.001	− 0.023	0.016	0.017	0.045	0.011	0.045	0.007
Total taxes	0.092	0.047	0.076	0.019	0.067	0.052	0.119	0.069	0.096	0.042
Social insurance	0.245	0.244	0.218	0.241	0.250	0.279	0.290	0.244	0.275	0.270
Private insurance	0.175	0.152	0.240	0.121	0.177	0.161	0.128	0.183	0.223	0.148
Direct payments	− 0.196	− 0.186	− 0.181	− 0.159	− 0.191	− 0.160	− 0.209	− 0.218	− 0.154	− 0.160
Total payments	0.019	− 0.027	0.012	− 0.034	0.004	− 0.014	0.036	− 0.028	0.036	− 0.020

Note. — Combined assumptions = individual weighting, net income as reference distribution, equivalization of payments (OECD equivalence scale).

TABLE 5

Impact of different assumptions — Kakwani indices. Direction of longitudinal effect

	Baseline	Individual weighting	Net income	Equival. payments	Combined assumptions
Direct taxes	–	–	–	–	–
Indirect taxes	–	–	0	–	–
Total taxes	–	–	–	–	–
Social insurance	–	+	+	–	0
Private insurance	–	–	–	+	–
Direct payments	+	+	+	–	0
Total payments	–	–	–	–	–

Notes:

+ = more progressive.
– = less progressive.
0 = less than 0.01 points of the π_K index in either direction.
Combined assumptions = individual weighting, net income as reference distribution, equivalization of payments (OECD equivalence scale).

4.5 — Net income as a measure of ability to pay

A further issue on which there are grounds for disagreement is the use of gross income as the reference distribution. Once again this is common practice in the health care finance literature. However, it seems illogical to measure the distribution of direct payments, private insurance premiums and indirect taxes in relation to this distribution since what effectively constrains households are their disposable incomes (*i. e.* after direct taxes and other contributions) (6). This suggests that distinct reference income distributions should be used for different types of payment. Future analyses may wish to consider this issue in greater detail. Meanwhile, it is useful to measure the impact of using disposable income as a measure of ability to pay to calculate the progressivity indices reported earlier. The precise income definition that is used is household income net of state and local direct taxes and social insurance contributions, equivalized by the OECD scale.

The results indicate quite naturally that the value of the Gini coefficient is reduced *vis-à-vis* the baseline distribution. Inequality in the disaggregated payments distributions also declines, leading to varied measurement and intertemporal effects. The impact on the overall payments distribution is to make the 1980's change towards regressivity much smaller than under the baseline assumptions (two points of the π_K index as opposed to 5). This implies that in the event of 'source-appropriate' reference distributions being chosen, the fall in progressivity would not be as great as shown in section 3. However, the results also indicate that this is simply a question of the size of the effect; the general conclusions reached earlier would still be valid.

(6) Studies of the progressivity of indirect taxes do in fact adopt net or disposable income as the reference distribution [see, *e. g.* Kakwani (1986, chapter 10)].

4.6 — The effect of equivalizing payments

Besides incidence assumptions, there are other plausible conjectures that might have been adopted for the payments variables. Chief among these is the equivalization of household payments to take account of differences in demographic structure. As in the majority of previous studies, the approach was not followed in the analysis of section 3 given that it is generally accepted that economies of scale do not operate in health care consumption. However, this conjecture only seems valid for direct expenditures and even then it is possible to think of exceptions to the rule. With regard to other forms of payment, the no-equivalization hypothesis seems harder to defend (*e. g.* the case of two families of size 1 and 5 each with a single wage earner making social insurance contributions that provide benefits to all family members). Moreover, recent health care financing progressivity estimates have opted to equivalize payments (*e. g.* Wagstaff *et al.*, 1994) (7). Consequently, it seems appropriate to measure the impact of adjustments for household structure in the payments distributions.

Household payments towards the health service were equivalized using the OECD scale. The progressivity estimates produced by adopting this assumption tend to have the opposite effect to the two previous sensitivity analyses. That is, the progressivity (regressivity) of progressive (regressive) sources is increased. The conclusions regarding the intertemporal change in health care finance progressivity are not greatly affected, though the magnitude of the changes is more pronounced than with other assumptions. There is almost a 7 point difference between the 1980 and 1990 overall payments Kakwani indices. Thus, equivalization of payments also leads to the later distribution appearing more inequitable than that of the earlier period.

4.7 — Combining alternative assumptions

As a final step in the analysis indices were computed by combining the final three assumptions (see tables 4 and 5). Therefore, besides other conjectures previously laid out in section 2, the methodology now admits individual weighting of income units, equivalized net income as the counterfactual distribution and health care payments equivalized by the OECD scale. The purpose of this step is to verify if the results are robust to a combination of alternative plausible assumptions, rather than admitting a single variation at a time. The results confirm the general intertemporal trends identified earlier, in particular the shift from mild progressivity to mild regressivity of the overall health care payments distribution. Noticeably, the absolute change in the Kakwani index is greater than under the baseline assumptions.

Therefore, the sensitivity analyses generally show that the earlier estimates are robust in terms of alternative methodological assumptions. In particular, the evolution of health care finance progressivity from 1980 to 1990 is not cast into

(7) This option appears to have emerged simply because of the motivation to measure redistributive effect, in which case both income and payments distributions have to be equivalized in order to achieve comparability.

doubt. It follows that, although there may be disagreement among economists as to particular procedures, some relatively strong conclusions can be drawn about the structure and recent course of health care finance progressivity in Portugal.

5 — Conclusions

Recent research drawing on household budget surveys has shown that, throughout the 1980's, a fundamental change took place in the distribution of health care financing in Portugal. Total payments to the health system, which in 1980 revealed a mildly progressive structure, had evolved by the end of the decade towards a moderately regressive disposition. The burden of health care finance appears to have shifted to middle income groups, with the main beneficiaries being households situated in the richest quintile of the income distribution. This change is the result of two major trends: on the one hand, reduced progression in the tax system; and on the other, an increase in the share of revenues raised directly from consumers.

It is possible to disagree with these results on two main fronts: the data used and the methods of analysis. The first question is beyond the scope of this article, though it should be noted that there is a need for further research using new data sources. Although care was taken to correct the biasing effect of the 1989 tax reform, its overlap with the survey observation period means that reasonable doubt may be cast on the estimates provided (and even more so on income inequality studies that have failed altogether to correct the double-payment by richer households). It is important that the present analysis (and related estimates using the same data bases by income inequality analysts) be replicated with new budget surveys once they are available.

As to the second issue, in contrast to previous research by health economists, this paper has devoted considerable effort to measuring the impact of methodological choices on the results. Under all the alternative scenarios considered the conclusions tend to be very much the same, varying only with respect to the *degree* of progressivity/regressivity. Therefore, the earlier results in Pereira (1996) summarized here would appear to be robust in terms of a number of important alternative assumptions. Evidence has been provided on the aggregation of health care payments inequality at different points of the income distribution; assumptions regarding the incidence of corporate taxation; equivalent scale adjustments to the income variable; the method of weighting observations; choice of ability to pay proxy; and equivalization of the payments distributions. On all these issues the intertemporal effect is not cast into doubt. However, the results also show that extreme care is required when comparing two or more studies (or periods) when key methodological assumptions adopted by authors differ.

Clearly there are further methodological issues that need to be investigated. Future studies might, for example, consider the question of measuring progressivity of payments to the NHS, rather than for the system as a whole. However, the general message is that recent evidence on health care financing progressivity in Portugal is robust.

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